

COMMONWEALTH OF VIRGINIA  
DEPARTMENT OF TRANSPORTATION  
**CONSTRUCTION DIRECTIVE MEMORANDUM**

GENERAL SUBJECT:	<u>ROADWAY SAFETY FEATURES</u>	NUMBER:	<u>CD-2003-3</u>
		DATE:	<u>July 9, 2003</u>
SPECIFIC SUBJECT:	<u>NCHRP 350 TEST REQUIREMENTS</u>	SUPERSEDES:	<u>CD-2001-8</u>
		SUNSET/ EXPIRES:	<u>December 31, 2008</u>

Original w/Signature on file in the Office of  
Construction Management

**DANIEL R. LISTON**  
**STATE CONSTRUCTION ENGINEER**

**DIRECTED TO - DISTRICT ADMINISTRATORS**

The attached INSTRUCTIONAL AND INFORMATION MEMORANDUM for ROADWAY SAFETY FEATURES dated June 26, 2003 is also CONSTRUCTION DIRECTIVE MEMORANDUM CD-2003-3.

This memorandum is for your records. Please be guided accordingly.

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C: Mr. Philip A. Shucet  
Mr. Claude D. Garver, Jr.  
Commissioners Staff  
Division Administrators  
District Construction Engineers  
District Maintenance Engineers  
District Materials Engineers  
District Equal Opportunity Managers  
District Contract Administrators  
Resident Engineers  
Project Engineers  
Project Inspectors  
Federal Highway Administration  
Virginia Department of Minority Business Enterprise  
Virginia Road and Transportation Builders Association  
Old Dominion Highway Contractors Association  
Virginia Asphalt Association  
Virginia Aggregates Association Inc.  
American Concrete Pavement Association  
Virginia Ready-Mixed Concrete Association  
Precast Concrete Association of Virginia

# LOCATION AND DESIGN DIVISION

## INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: ROADWAY SAFETY FEATURES	NUMBER: IIM-LD-222.3 MM-318 CD - 2003-3
SPECIFIC SUBJECT:  NCHRP 350 TEST REQUIREMENTS	DATE:  JUNE 26, 2003
	SUPERSEDES: IIM-LD-222.2 TE - 307 CD - 2001 - 8
LOCATION AND DESIGN DIVISION APPROVAL: <i>Mohammad Mirshahi, PE</i>	CONSTRUCTION MANAGEMENT APPROVAL: <i>Daniel R. Liston</i>
MOBILITY MANAGEMENT DIVISION APPROVAL: <i>Raymond J. Khoury, PE</i>	ASSET MANAGEMENT DIVISION APPROVAL: <i>James R. Smith, Jr.</i> Acting Director

Changes are shaded.

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### CURRENT REVISION

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- Revisions have been made to the approved products and compliance dates.
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### EFFECTIVE DATE

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- These instructions are effective upon receipt.
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### BACKGROUND

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- The National Cooperative Highway Research Program (NCHRP) published "Recommended Procedures for the Safety Performance Evaluation of Highway Features" in NCHRP Report 350. As a result of that report, the FHWA issued a requirement that all permanent safety hardware systems included in Federal Aid projects after August 1998 meet NCHRP 350.
  - VDOT also extended that requirement to state funded projects. A July 25, 1997 memo from FHWA provided additional requirements regarding dates and conditions of compliance. The compliance date (with some exceptions) was extended to October 1, 1998. This memo also divided work zone devices into four categories with explicit requirements for each of the categories, which we will parallel in this document.

- Subsequent to the July 25, 1997 memo, the following have been made available:
  - July 1, 1998 AASHTO-FHWA Agreement
  - August 28, 1998 memo from the Director, Office of Engineering FHWA, "Crash Tested Work Zone Traffic Control Devices"

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## LONGITUDINAL BARRIER

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- Standard GR-8 (Weak Post) Guardrail has been revised to meet NCHRP 350 testing criteria for high speed roadways. When installations of GR-8 Guardrail have been damaged and need repair/replacement, the guardrail should be "upgraded" to the new Std. GR-8.
- Standard GR-2 (Strong Post) Guardrail using a steel post, and blockouts made of wood or composite, have met NCHRP 350 criteria.

Any existing strong post guardrail installations not in accordance with NCHRP 350 criteria should not be repaired or replaced in kind but upgraded to meet NCHRP 350 when damaged or within the limits of a construction project. When damaged, the extent of damage should govern repair/replacement. If the total run of guardrail is 60 meters (200 feet) $\pm$ , the entire run shall be replaced with strong post (Std. GR-2) guardrail. For sections of guardrail that are longer than 60 meters (200 feet), if more than 60% of the entire run has been damaged, the entire run shall be replaced with strong post (Std. GR-2) guardrail. If less than 60% of the entire run has been damaged, the damaged section should be replaced with strong post (Std. GR-2) guardrail. Standard GR-3 (Cable) Guardrail met NCHRP 350 criteria.

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## NEW PAY ITEMS

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<u>ITEM CODE</u>	<u>DESCRIPTION</u>	<u>ITEM UNIT</u>
13290	Guardrail GR-8 (NCHRP 350 TL-3)	Linear Feet/Meters
13292	Guardrail GR-8A (NCHRP 350 TL-3)	Linear Feet/Meters
13294	Guardrail GR-8B (NCHRP 350 TL-3)	Linear Feet/Meters
13291	Radial Guardrail GR-8 (NCHRP 350 TL-3)	Linear Feet/Meters
13293	Radial Guardrail GR-8A (NCHRP 350 TL-3)	Linear Feet/Meters
13295	Radial Guardrail GR-8B (NCHRP 350 TL-3)	Linear Feet/Meters
13298	Radial Guardrail GR-8C (NCHRP 350 TL-3)	Linear Feet/Meters
13440	Median Barrier MB-5 (NCHRP 350 TL-3)	Linear Feet/Meters
13441	Median Barrier MB-5A (NCHRP 350 TL-3)	Linear Feet/Meters
13442	Median Barrier MB-5B (NCHRP 350 TL-3)	Linear Feet/Meters

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## GUARDRAIL TERMINALS

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- The MELT (Modified Eccentric Loaded Terminal - Standard GR-7) as it appears in the original 1996 Road and Bridge Standards has not passed NCHRP 350 test requirements to the satisfaction of the FHWA and is therefore not allowed for use after October 1, 1998. The new GR-7 with a revision date of 7/02 specifies designs that meet NCHRP 350 which include proprietary products such as the SRT350 and FLEAT350. These products have been approved by the FHWA for use as flared end terminals. If future testing produces additional options, VDOT's Road and Bridge Standards will be revised appropriately.
- Standard GR-6 Terminal Treatments for W Beam Guardrail is designed to be buried in the cut slope. This terminal design has been revised to meet the NCHRP 350 approved design recommended by FHWA and is furnished as an insertable sheet dated 7/02.
- Standard GR-9 Alternate To the Flared End Terminal is a parallel terminal design that is used for situations in which the flared terminal (Standard GR-7) cannot be installed due to site restrictions. VDOT's Road and Bridge Standards detail specifies that only products approved in accordance with NCHRP 350 test criteria (such as ET-2000, SKT-350, or BEST 350) are acceptable for use as Standard GR-9.

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## IMPACT ATTENUATORS / CRASH CUSHIONS

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- All designs used for permanent installations of impact attenuators / crash cushions must have FHWA approval letter specifying compliance with NCHRP 350 test requirements. (See attached table)

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## CONCRETE BARRIER

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- Concrete Median Barrier meets NCHRP 350; however, testing has proven that impacts with "F" shape barrier resulted in better vehicle stability than with the "New Jersey" shape, especially for smaller vehicles, due to a reduction in the height of the break between the upper and lower slopes. Therefore, VDOT has required the "F" shape concrete median barrier since the January 2000 advertisement. The Department allowed a transition period before requiring the new "F" shape.
- From the January 1996 advertisement until January 2000, contractors were allowed the option of providing either of two types of concrete barrier, as noted below:
  - "New Jersey" shape or "F" shape \*
- Note: "F"-Shape barrier was required on selected projects that required more than 2300 meters (7500 ft.) of barrier or other selected projects when required in contract documents.

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## BREAKAWAY OR YIELDING SUPPORTS FOR SIGNS AND LUMINAIRES

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- Includes items such as wood posts, slip bases, breakaway couplers, frangible bases, etc.
- The Department uses devices that currently conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals. The requirements of AASHTO are more stringent than those contained in NCHRP 350 and therefore existing devices are considered to be acceptable.

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## WORK ZONE DEVICES

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- CATEGORY 1 DEVICES

- Includes items such as drums, cones, tubular markers, self-erecting delineator posts without any auxiliary device mounted on them except for Type A or C warning lights on drums and ballast located at the base of the devices.

These devices are small and lightweight channelizing and delineating devices that carry virtually no potential to penetrate windshields, cause tire damage or have a significant impact on the control or trajectory of an impacting vehicle. These devices will, however, require certification by the manufacturer that their device is crashworthy – that it meets the evaluation criteria of NCHRP 350 Test Level 3. This certification may be a one-page affidavit signed by the manufacturer. When Type A or C warning lights are used on drums, the certification letter shall indicate that the drum and warning light combination is crashworthy.

- CATEGORY 2 DEVICES

- Includes Category 1 devices (drums, cones, etc.) with an auxiliary device (warning light except a Type A or C warning light on drums, sign, etc.) mounted on it, portable vertical panel assemblies, portable sign supports, intrusion detectors and alarms, and Type I, II and III Barricades.
- These devices are not expected to produce significant vehicular velocity change, but may otherwise be hazardous by penetrating a windshield, injuring a worker or causing vehicle instability when driven over. The Department has developed an approved list of those devices that comply with NCHRP 350 Test Level 3 and our specifications, and will maintain it on VDOT's web site. When a device is intended to be used that does not appear on the list, a copy of the FHWA acceptance letter for complying with NCHRP 350 will be required from the manufacturer prior to utilizing that device. On construction/maintenance projects the Contractor will be required to furnish a certification letter indicating those devices he intends to use are on the approved list or FHWA acceptance letters for devices not existing on the Department's approved list.

- Category 1 devices with an auxiliary device attached (except drums with a Type A or C warning light)

These devices shall have been tested with the type of auxiliary device attached for conformance with NCHRP 350, Test Level 3, and an acceptance letter issued by FHWA.

- Portable Vertical Panel Assemblies

Portable Vertical Panel Assemblies shall have been tested for conformance with NCHRP 350, Test Level 3, and an acceptance letter issued by the FHWA. Portable vertical panel assemblies with an auxiliary device mounted on it shall not be used unless they have been tested and approved under NCHRP 350, Test Level 3.

- Portable Sign Supports

- Tripod Type

Tripod portable sign supports shall not be used.

- Self-erecting Type

Self-erecting portable sign supports shall have been tested with the type of sign that is intended to be used with it for conformance to NCHRP 350, Test Level 3 and an acceptance letter issued by the FHWA. Other sign materials are allowed for use on the Portable Sign Supports when approved by the FHWA and indicated in an FHWA acceptance letter.

- Intrusion Detectors and Alarms

These devices shall have been tested for conformance to NCHRP 350, Test Level 3 and an acceptance letter issued by the FHWA. Even though these devices are not normally required on projects, the Contractor will be required to furnish a copy of the FHWA acceptance letter if they plan to use such a device.

- Type I and II Barricades

These devices are not used by the Department and therefore will not affect our operations.

- Type III Barricades

These devices shall have been tested for conformance to NCHRP 350, Test Level 3 and an acceptance letter issued by the FHWA. (The current Standards BD-1 and 2, available as insertable sheets and VDOT's Road & Bridge Standards shall no longer be used.)

- CATEGORY 3 DEVICES

- Includes items such as barriers, crash cushions, fixed sign supports, and truck mounted attenuators.

- These devices can cause significant velocity changes or other potentially harmful reactions to impacting vehicles.
- Concrete Traffic Barrier Service

For **temporary** locations, either "New Jersey" or "F" shape Concrete Traffic Barrier Service may be used until the January 2000 advertisement. After that date, only the "F" shape will be allowed. Whenever the new shape is used in conjunction with a temporary installation, a positive connection (joint that transfers tension and moment from one segment to another) will be required. Beginning with the January 2000 advertisement, all positive connections must be approved in accordance with NCHRP 350.

When Temporary Concrete Traffic Barrier Service is being used on any VDOT project, the barrier deflection must be taken into account when planning work zones. The deflection area must remain free of hazards such as steep fill slopes, construction equipment, personnel, etc.

- Temporary Attenuators/Crash Cushions

These devices shall have been tested for conformance to NCHRP 350 and an acceptance letter issued by the FHWA. This is effective for devices used by the Department beginning January 1, 1999, and for construction/maintenance projects beginning with January, 1999 advertisements. Until January, 1999, devices held in stock were permissible as long as these items met NCHRP 230 and the items are not deficient in any way that would jeopardize safety. Devices purchased after 10/01/98 shall meet NCHRP 350 requirements.

- Fixed Sign Supports

The Department uses wood posts and other supports, which are listed in the Department's Special Products Evaluation List (SPEL), for fixed sign supports. These devices currently conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals. The requirements of AASHTO are more stringent than those contained in NCHRP 350 and therefore existing devices are considered to be acceptable.

- Truck Mounted Attenuators

Truck mounted attenuators purchased after October 1, 1998 shall have been tested for conformance to NCHRP 350 and an acceptance letter issued by the FHWA. Truck mounted attenuators used on all Limited Access Highways, and four or more lane Primary Highways with speed limits 55 mph or greater, shall conform to NCHRP 350, Test Level 3. On all other highways, truck mounted attenuators may conform to either NCHRP 230 or NCHRP 350 unless otherwise specified by the contract for a specific project. However, NCHRP 350, Test Level 3 units are required for use on all highways on 07/01/2005 regardless of the purchase date.

- CATEGORY 4 DEVICES

- Includes portable items, usually trailer-mounted devices such as area lighting supports, arrow boards, portable traffic control signals, and portable changeable message signs.

- The FHWA has determined that time is needed to:
    - conceive and evaluate alternate measures for making these devices crashworthy,
    - examine the use and crash histories of existing devices, review and, if needed, develop safer, cost-effective strategies for the placement or replacement of these devices that will provide motorists needed information for driving in work zones.
  - An announcement of an implementation date is anticipated by October 1, 2003.
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## VDOT APPROVED PRODUCTS

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For information regarding VDOT approved products in the lists that follow, please contact Engineering Services at (804) 786-2543 or refer to the following web site:

<http://www.virginiadot.org/business/locdes/nchrp350-index.asp>

Click on OPPORTUNITIES NETWORK; Select LOCATION AND DESIGN to view the NCHRP 350 approved products.



## **CRASH CUSHIONS** **(NCHRP 350 Approved)**

ENERGY ABSORPTION SYSTEMS, INC.	<p>TL-1 &amp; TL-2 NEAT Non-Redirective, Guards Precast Traffic Barrier Service Concrete and QMB (CZ only)</p> <p>TL-2 QUADGUARD ELITE (7 BAY) Redirective Crash Cushion</p> <p>TL-3 QUADGUARD ELITE (11 BAY) Redirective Crash Cushion</p> <p>TL-1, TL-2 &amp; TL-3 ENERGITE III Non-Redirective Sand Module (CZ or permanent)</p> <p>TL-2 &amp; TL-3 QUADGUARD Redirective Crash Cushion (CZ or permanent)</p> <p>TL-3 QUADGUARD-WIDE Redirective Crash Cushion (permanent)</p> <p>TL-3 QUADGUARD LMC Low Maintenance Redirective Crash Cushion (permanent)</p> <p>TL-3 BRAKEMASTER Redirective Terminal/Crash Cushion (permanent)</p>
ROADWAY SAFETY SERVICE	<p>TL-3 REACT 350 Redirective Crash Cushion (CZ or permanent)</p> <p>TL-1, TL-2 &amp; TL-3 FITCH UNIVERSAL MODULE Non-Redirective Sand Module (CZ or permanent)</p>
TRINITY INDUSTRIES SYRO STEEL	<p>TL-3 CAT Redirective Terminal/Crash Cushion (permanent)</p> <p>TL-3 ADIEM Redirective Lightweight Concrete Crash Cushion (For use in CZ only)</p> <p>TL-2 &amp; TL-3 TRACC Redirective Crash Cushion (CZ or Permanent)</p> <p>TL-3 FASTRACC Redirective Crash Cushion (CZ or Permanent)</p> <p>TL-3 WIDETRACC Redirective Crash Cushion (CZ or Permanent)</p> <p>TL-2 SHORTRACC Redirective Crash Cushion (CZ or Permanent)</p>
TRAFFIC DEVICES	<p>TL-1, TL-2 &amp; TL-3 BIG SANDY Non-Redirective Sand Module (CZ or permanent)</p>
BARRIER SYSTEMS, INC.	<p>TL-2 &amp; TL-3 ABSORB 350 Non-Redirective Crash Cushion for Precast Traffic Barrier Service Concrete and QMB</p> <p>TL-2 TAU-II (4 bay) Redirective Crash Cushion</p> <p>TL-3 TAU-II (8 bay) Redirective Crash Cushion</p>

TL-1, 30 MPH Max.  
TL-2, 45 MPH Max.  
TL-3, >45 MPH

Note: CZ refers to Construction Zone  
QMB refers to Quickchange Moveable Barrier

**TERMINALS**  
**(NCHRP 350 Approved)**

<b>INTERSTATE STEEL/ROAD SYSTEMS, INC.</b>	<b>TL-3 BEST 350</b>	<b>VDOT ST'D. GR-9</b>
	<b>TL-3 SEQUENTIAL KINKING TERMINAL (SKT-350)</b>	<b>VDOT ST'D. GR-9</b>
<b>TRINITY INDUSTRIES SYRO STEEL</b>	<b>TL-3 SLOTTED RAIL TERMINAL (SRT-350) for W. Beam Guardrail</b>	<b>VDOT ST'D. GR-7</b>
	<b>TL-3 CAT</b>	<b>VDOT ST'D. GR-9</b>
	<b>TL-3 ET-2000</b>	<b>VDOT ST'D. GR-9</b>
	<b>ET-PLUS with SYTP (Steel Yielding Terminal Post)</b>	<b>VDOT ST'D. GR-9</b>
<b>ROAD SYSTEMS, INC.</b>	<b>TL-3 FLARED ENERGY ABSORBING TERMINAL (FLEAT-350)</b>	<b>VDOT ST'D. GR-7</b>
<b>ENERGY ABSORPTION</b>	<b>TL-3 BRAKEMASTER</b>	<b>VDOT ST'D. GR-9</b>

**CRASHWORTHY LONGITUDINAL BARRIERS**  
**(NCHRP 350 Approved)**

<b>BARRIER SYSTEMS, INC.</b>	<b>TL-3 Narrow Quick Change Moveable Barrier</b>
<b>IOWA DOT</b>	<b>TL- 3 Iowa PCB Temporary CMB F-shape with Pin and Loop Connection</b>
<b>ROCKINGHAM PRECAST</b>	<b>TL-3 Temporary CMB-F shape, 12'-0" long with Slotted Tube/T-Bar Connection</b>

**CRASHWORTHY LONGITUDINAL BARRIERS**  
**(NCHRP 350 Approved unless otherwise noted)**  
**-continued-**

<b>SMITH-MIDLAND</b>	<b>TL-3 Temporary Concrete Median Barrier F-shape and New Jersey shape with J-J Hook Connection</b>
<b>VIRGINIA DOT</b>	<b>Temporary Concrete Median Barrier F-shape with Pin and Loop connection (20'-0" Length)</b>
<b>BARRIER SYSTEMS, INC.</b>	<b>TL-3 Quickchange Moveable Barrier (QMB) Moveable Barrier</b>
<b>PENNSYLVANIA DOT</b>	<b>TL-3, 12'-6" Long Temporary Concrete Median Barrier F-Shape with Plate Connection</b>

**PORTABLE VERTICAL PANELS**  
**(NCHRP 350 Approved)**

<b>IMPACT RECOVERY SYSTEM</b>	<b>Vertical Panel</b>
<b>WOUDENBERG ENTERPRISES</b>	<b>Msi Durastem Vertical Panel w/ Lightweight Warning Light</b>
<b>FLASHER HANDLING CORP.</b>	<b>Air Spill Barricade Vertical Panel</b>
<b>BENT MANUFACTURING COMPANY</b>	<b>Vertical Panel w/ Lightweight Warning Light</b> <b>ULTRA Vertical Panel w/ Lightweight Warning Light</b>
<b>WLI INDUSTRIES, INC.</b>	<b>SafetyCade Vertical Panel</b> <b>SafetyCade Extended Vertical Panel</b> <b>w/ Lightweight Warning Light</b>
<b>SERVICE SIGNING, L.C.</b>	<b>Vertical Panel</b>
<b>EASTERN METAL / U.S.A. SIGNS</b>	<b>Melba Vertical Panel</b>

**MAILBOX SUPPORTS**  
**(NCHRP 350 Approved)**

<b>FRIEND TOWN AND COMPANY</b>	<b>Breakaway Mailbox</b>
<b>FORESIGHT PRODUCTS, INC.</b>	<b>V-Loc Mailbox Support System</b>
<b>S-SQUARE TUBE PRODUCTS</b>	<b>Nex Tube Mailbox Support System</b>

## **CHANNELIZING DEVICES WITH AUXILIARY DEVICES\*** **(NCHRP 350 Approved)**

<b>FLASHER HANDLING CORP.</b>	<b>Plastic Substrate Sign Panel Mounted on face of Drum.</b>
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\* Drums with Type A or C warning lights are acceptable as Category 1 devices and therefore will not be listed in this document.

## **PORTABLE SIGN SUPPORTS** **(NCHRP 350 Approved)**

<b>EASTERN METAL/USA SIGNS</b>	<b>Super Flex Compact Stand with Fiberglass Leaf Spring C-102, C-132, C-142, C-200, C-202, C-232, C-242, C-802, C-832, C-842, C-902, C-942, X-501, X-550, X-551, X-600, X-601 Portable Sign Stands with roll-up signs only. Model Number X-842 with 0.080" Aluminum or 2mm AL/LDPE (Alpolic, Reynolite and Dibond) laminated substrates, Model Number X-880 with 2mm AL/LDPE laminated substrate, and Model Numbers X552, X552b and X-602 with 0.080" aluminum signs or 2mm AL/LDPE laminated substrate.</b>
<b>FLASHER HANDLING CORP.</b>	<b>Bantam 2 portable sign stand, Featherweight 2 sign stand with roll-up signs.</b>
<b>DICKIE TOOL COMPANY</b>	<b>Model Numbers DL1003W, QLV-W, MSRIGID-30, QFV-60, QFV-84, PS-3330, PS-3330-S, DF3003, DF3000S, DF3003W, MSFLEX-30, QFV-48, DF3003S, PS-3000S, DF3000WQ, DF-4700, DF-4700TX, DF-4503, Uniflex 2000 and DL1003WQ with roll-up type sign only, and SLIP-60 with roll-up type sign or with 0.080" aluminum signs.</b>
<b>MARKET DISPLAYS INTERNATIONAL (MDI)</b>	<b>Model Numbers 4814CS, 4814DLK, 4814HDK, 4814SSCK, 30CAM, 40CAM, 4814NSCK, 4884CS, 4860KA, 4850, 4812, 4815, 4814K with roll-up type signs. Model Numbers 4818 and 4860K with roll-up 0.080" Aluminum, or 10mm Coreplast and Inteplast corrugated plastic sign substrate or 2mm AL/LDPE (Alpolic, Reynolite and Dibond) aluminum laminated substrate signs.</b>

**PORTABLE SIGN SUPPORTS  
(NCHRP 350 Approved)  
continued**

<p style="text-align: center;"><b>KORMAN SIGNS, INC.</b></p>	<p>Model Numbers SS560, SS560A, SS560E, and SS560AE with roll-up type signs or 0.100" and 0.080" aluminum type signs or 6.55mm Solid Plastic (ABS) substrate, or 2mm AL/LDPE (Alpolic, Reynolite and Dibond) laminated substrates. Minimum Mounting Height: 60" for diamond, 63" for rectangle. Model Numbers SS548, SS548A, SS548E, SS548AE, SS548C, SS548CE, SS548CA and S548CAE with roll-up type signs or 10mm corrugated plastic, or 2mm AL/LDPE (Alpolic, Reynolite and Dibond) laminated substrates. Minimum Mounting Height: 21". Model Numbers SS548UC, SS548UCA, SS548UCX and SS548UCAX with roll-up type signs or 2mm AL/LDPE (Alpolic, Reynolite and Dibond) laminated substrates. Model Numbers SS548UCR, SS548UCRA, SS560UCR, SS560UCRA, SS548UCRX, SS548UCRAX, SS560UCRX and SS560UCRAX with roll-up type sign only.</p>
<p style="text-align: center;"><b>TRAFFIX DEVICES, INC.</b></p>	<p>Big Buster Dual Spring Folding Leg sign stand with roll-up, 0.080" aluminum or 2mm AL/LDPE (Alpolic, Reynolite and Dibond) aluminum laminated substrate, or 10mm Coreplast and Inteplast corrugated plastic sign substrate, Little Buster Dual Spring Folding Leg sign stand with roll-up, 0.080" aluminum mounted minimum 18 inches from bottom of sign, or 2mm AL/LDPE (Alpolic, Reynolite and Dibond) aluminum laminated substrate, or 10mm Coreplast and Inteplast corrugated plastic sign substrate, Econo Buster sign stands with roll-up or 2mm AL/LDPE sign.</p>
<p style="text-align: center;"><b>SIGN UP CORPORATION</b></p>	<p>Model Numbers 1000X, 5000X, X-CELL, MS-2000xi, 27-SSX, 38-SSB, 48-SSB sign stands with roll-up type signs only.</p>
<p style="text-align: center;"><b>RADIATOR SPECIALTY COMPANY</b></p>	<p>Model Numbers JL1000, JS3000, JS4000, JS4700 with roll-up signs only.</p>

**PORTABLE SIGN SUPPORTS  
(NCHRP 350 Approved)  
(continued)**

<b>PACIFIC SAFETY SUPPLY, INC.</b>	Model Numbers PS-3330 and PS-3000-S sign stands with roll-up type signs.
<b>LANG PRODUCTS INTERNATIONAL, INC.</b>	Model Numbers Basic TM 48, Basic TM 48 stand w/SnapFlag TM Dual Warning Flag system, CrossWindTM 204-HD, CrossWindTM 204-HD w/SnapFlag Dual Warning Flag system, 404-HD2 and 405-HD2 . All models are to use roll-up type signs.
<b>FLEX-O-LITE SERVICES AND MATERIALS CO.</b>	Model Numbers QLV-W, QFV60, QFV-W, QFV48 sign stands with roll-up type signs.
<b>BONE SAFETY SIGNS</b>	Model Numbers SZ-412, SZ-412/S, SZ-460, SZ-460/S, SZ-484, SZ-484/S sign stands with roll-up type signs.

**TYPE III BARRICADES\*  
(NCHRP 350 Approved)**

<b>BENT MANUFACTURING COMPANY</b>	Type III Barricade
<b>RECYCLED PLASTIC PRODUCTS</b>	Type III Barricade w/ Lightweight Warning Light
<b>FLASHER HANDLING CORP.</b>	Type III Barricade
<b>CANTEL OF MEDFORD, INC.</b>	EZ-UP Type III Barricade
<b>DAVIDSON PLASTICS CORP.</b>	T3B Plastic Type III Barricade
<b>EASTERN METAL/USA SIGNS.</b>	Type III Barricade
<b>PLASTIC SAFETY SYSTEMS, INC.</b>	Type III Barricade (WZ-61 Approval Number)
<b>AMERICAN FENCE &amp; FAB, INC.</b>	Type III Barricade (WZ-65 Approval Number)
<b>ST. LOUIS STEEL PRODUCTS</b>	Type III Barricade (WZ-71 Approval Number)
<b>THREE D TRAFFIC WORKS, INC.</b>	Type III Barricade (WZ-82 Approval Number)
<b>TRAFFIC DEVICES, INC.</b>	Type III Barricade (WZ-108 Approval Number)
<b>TRAFCON, INC.</b>	Type III Barricade (WZ-116 Approval Number)
<b>NES WORK SAFE</b>	Type III Barricade (WZ-120 Approval Number)

**TYPE III BARRICADES\***  
**(NCHRP 350 Approved- continued)**

<b>XCESSORIES SQUARED</b>	<b>Type III Barricade (WZ-148 Approval Number)</b>
<b>BENT MANUFACTURING CO.</b>	<b>WZ-06 Approval Number</b>
<b>RECYCLED PLASTIC PRODUCTS</b>	<b>WZ-03 Approval Number</b>
<b>FLASHER HANDLING CORP.</b>	<b>WZ-40 Approval Number</b>
<b>CANTEL OF MEDFORD, INC.</b>	<b>WZ-31 Approval Number</b>
<b>DAVIDSON PLASTICS CORP.</b>	<b>WZ-39 Approval Number</b>
<b>EASTERN METAL/USA SIGNS</b>	<b>WZ-59 Approval Number</b>

- \* Any Type III Barricade may have roll-up signs attached and still be in compliance with NCHRP 350 requirements. In addition, 10mm corrugated plastic or 2mm AL/LDPE (Alpolic, Reynolite and Dibond) laminated substitutes mounted a minimum of 87" to the top of the sign unless otherwise directed by the FHWA may be used and still be in compliance with NCHRP 350 requirements.

**TRUCK MOUNTED ATTENUATORS \***  
**(NCHRP 350 Approved)**

<b>ENERGY ABSORPTION</b>	<b>TL-2 ALPHA 70K TMA</b> <b>TL-3 ALPHA 100K TMA</b> <b>TL-3 SAFE STOP TMA</b>
<b>TRINITY INDUSTRIES SYRO STEEL</b>	<b>TL-2 MPS 350 TMA</b> <b>TL-3 MPS 350 TMA</b>
<b>IMPACT ABSORPTION</b>	<b>TL-3 VANDERBILT TMA</b>
<b>ALBERT UNRATH, INC.</b>	<b>TL-3 U-MAD 100K TMA</b>
<b>TRAFFIX DEVICES, INC.</b>	<b>TL-2 SCORPION A 10,000 TMA</b> <b>TL-3 SCORPION C 10,000 TMA</b>
<b>RENCO, INC.</b>	<b>TL-2 REN-GARD 815 TMA</b> <b>TL-3 RAM 100K TMA</b>

- **NOTE:** On 01/01/2003, TL-3 TMA's are required on all Limited Access Highways, and on all 4 or more lane Primary roadways with posted speeds of 55 mph or greater.
- TL-2 units may be used on all roadways except Limited Access Highways and four or more lane Primary roadways with posted speeds of 55 mph or greater until 07/01/05.
- All TMA's shall be TL-3 units on 07/01/05.